REMARKS

Applicants thank the Examiner for the thorough examination of the application. No new matter is believed to be added to the application by this amendment.

Amendments to the Specification

The amendments to the specification correct a minor error and find support at page 58, line 6 of the originally filed specification. The amendments to the abstract correct minor errors.

Status of the Claims

Claims 1-14 and 16-25 are pending in the application. Applicants elected claims 1-18 and 22-24 with traverse in the paper filed March 5, 2003. Claims 1-18 stand rejected.

Claim 15 is cancelled by this amendment. The amendments to claim 1 incorporate subject matter from cancelled claim 15. Claim 25 sets forth subject matter from cancelled claim 15. The amendments to claims 2-14 and 16-18 and 20-24 improve the language of these claims without reducing their scope.

Rejection Under 35 U.S.C. §103(a) Over Yamazaki In View Of Nakao

Claims 1-18 are rejected under 35 U.S.C. §103(a) as being obvious over Yamazaki (U.S. Patent 6,266,113 B1) in View Of Nakao (U.S. Patent 6,452,650 B1). Applicants traverse.

The Present Invention And Its Advantages

The present invention pertains to a novel transmittable light scattering sheet. Claim 1 sets forth: "A transmittable light-scattering sheet which comprises a light-scattering layer composed of a plurality of polymers varying in refractive index and having at least a droplet phase structure, wherein the layer has a phase separation structure formed by spinodal decomposition from a liquid phase comprising the plurality of polymers."

The advantages of the inventive technology include strong reflected light intensities at specific light scattering angles. The invention yields high directionalities and brightness of the display surface over a wide angle range. See Tables 1 and 2 at pages 56 and 63 of the specification.

Also, the spinodal decomposition results in unique properties. This is discussed in the paragraph starting at page 29, line 20 of the specification, which states:

> Further, since the light-scattering layer (2) is formed by spinodal decomposition via evaporation of solvent from liquid phase comprising a plurality of polymers (liquid phase such as mixed solution or liquid mixture, and solution in ordinary temperature), it is considered that,

> in the process of evaporating solvent, the phase separation structure, in which average distance between domains has two kinds of regularities owing to the difference in compatibility of the constituting polymer component with substrate material, is formed. When such transmittable light-scattering sheets are used, the incident light is substantially isotropically scattered and high directionality and diffusibility together can be imparted to the transmitted scattered light.

Therefore, the invention produces unique light scattering properties that represent a fundamental improvement over the conventional art.

Distinctions Of The Invention Over Yamazaki and Nakao

Yamazaki pertains to a reflection type liquid crystal display device. The technology of Yamazaki is typified by claim 1, which states:

> 1. In a reflection type liquid crystal display device comprising a light modulation layer disposed between a pair of electrodes, at least one of which is transparent electrode, the light modulation layer being controlled to take on one of a light scattering state and light transmitting state in accordance with a voltage applied between the electrodes; at least one color separation layer mounted at the back of the light modulation layer; and a reflection layer mounted at the back of the color separation layer; wherein the color separation layer comprises one of a cholesteric liquid crystal polymer layer for reflecting light within a predetermined wavelength range and a dielectric multi-layered thin film for transmitting a light within a predetermined wavelength range and reflecting light outside the predetermined wavelength range.

The operation of this type of display is discussed by Yamazaki at column 3, lines 26-36, which states:

> In the case of the reflection type liquid crystal display device having the structure in which the droplet type polymer dispersed type liquid crystal layer is used as the light modulation layer and in which the interference filter and the mirror layer as the reflection layer are arranged at the back, with no application of voltage (i.e., in the transparent state), the liquid crystal molecules can be arrayed not in the field direction but at an angle to cause an inconsistency between the longitudinal refractive index of the liquid crystal molecules and the refractive index of the polymer thereby to leave a slight dispersion. As a result, the regularly reflected light is diffused with a width to raise a problem in that the invisible range is widened, and the diffused color is mixed with the color having passed through the color separation layer to raise the problem that the color purity drops.

Yamazaki modulates light as discussed at column 43, lines 32-38, which states:

> The light modulation layer comes, when the voltage is not applied, into a scattered state like the paper white, and, when applied, into a highly transparent state so that an arbitrary color such as the red, blue or green color can be reconstructed as a highly pure color to provide an excellent contrast by the combined action of the color separation layer and the reflection layer.

Yamazaki fails to disclose a composition of a plurality of polymers varying in refractive index and having at least a droplet phase structure. The Examiner admits to the failings of Yamazaki at page 2, lines 17-19 of the Office Action. The Examiner then tries to apply the teaching of Nakao to address the failings of Yamazaki.

The technology of Nakao is typified by claim 1 of the patent, which states:

> 1. A polymer dispersion type liquid crystal display element comprising:
>
> a pair of substrates, one of the substrates being an active matrix substrate having thin film transistors formed thereon;
>
> an electrode formed on an opposite surface of each of the substrates;
>
> polymers;
>
> liquid crystal droplets being deformed into a compressed structure compressed in a cell gap direction; and
>
> a polymer-liquid crystal complex held between the pair of substrates, the polymer-liquid crystal complex comprising the polymers and the liquid crystal droplets dispersed in the polymers;
>
> wherein:
>
> an amount of deformation of the liquid crystal droplets is set to be in range in which a phenomenon of liquid crystal molecules rising up in the cell gap direction is not caused by excluded volume effects of the liquid crystals;
>
> when an anchoring strength is represented by a driving voltage V_{90}, where V_{90} is a driving voltage at a transmittance of 90%, the anchoring strength being an index showing the interaction of the polymers and liquid crystal at the phase boundary between the liquid crystal and the polymers, the anchoring strength is such that the driving voltage V_{90} is in the range of about 7.5 V to about 12.5 V; and
>
> a deformation rate of the liquid crystal droplets is 20% or lower.

Nakao describes "a plurality of polymer liquid crystal complex layers are laminated, so that the liquid crystals in each layer can be aligned in parallel with the substrates and also the

orientations of the liquid crystals aligned in a plane parallel with the substrates can be made different for each of the layers." See Nakao at column 48, lines 41-45. With regard to the average diameter of the liquid crystal droplet, Nakao states "The smaller the particle diameter of the liquid crystals droplets becomes, the further the scattering of light increases in intensity, so it is desirable for application to the scattering type liquid crystal display element that the liquid crystal droplets have a size of 2 μm or less." See Nakao at column 19, lines 44-49. Nakao discusses the distance between liquid crystal droplets at column 36, lines 1-5, stating "when the polymer dispersion type liquid crystal display element thus produced was measured with a microscope on an average mesh size (gaps between liquid crystal droplets of an average mesh size aligned in parallel with the plane of the substrates), the average mesh gap was 1.2 μm." Nakao at column 36, lines 6-10 discusses alignment, stating "the liquid crystal molecules allowed to be fully aligned in parallel to the electric field by applying 10V, 30Hz of rectangular waves to the transference electrodes 13, 14 of the polymer dispersion type liquid crystal element." Nakao at column 48, lines 62-63 states: "A layered product 127 is held via the transparent glass substrates."

Finally, Nakao at column 5, lines 22-25 purports to produce a "polymer dispersion type liquid crystal display element capable of

providing improved scattering characteristics without any deterioration of display characteristics . . ."

Both Yamazaki and Nakao fail to disclose or suggest spinodal decomposition from the liquid phase comprising a plurality of polymers for forming the phase separation structure.

That is, the droplet phase of both Yamazaki and Nakao are obtained by forming a polymer-liquid crystal complex of photopolymerizable monomers and liquid crystalline materials to photopolymerize only the monomers. Yamazaki and Nakao both fail to disclose spinodal decomposition from the liquid phase. The present invention's mechanism for forming the droplet phase is therefore fundamentally different from that of Yamazaki or Nakao. As a result, a person having ordinary skill in the art would not be motivated by the teachings of Yamazaki and Nakao to produce a claimed embodiment of the invention. Thus a *prima facie* case of obviousness has not been made over Yamazaki and Nakao.

Further, even if one assumes *arguendo* that Yamazaki and Nakao can be combined to allege *prima facie* obviousness, this obviousness would be rebutted by unexpected results.

The droplet phase structure of Yamazaki and Nakao are formed by photopolymerizing monomers, and the liquid crystalline materials are dispersed randomly in a photopolymerized polymer. Since the interphase distance of the liquid crystals (a dispersed phase)

cannot be precisely controlled, a phase separation structure having regularities in the average distance between domains could not form.

The structures of Yamazaki and Nakao therefore correspond to Comparative Examples 1-3 set forth at pages 53, 59 and 60 of the specification. Similar to Yamazaki and Nakao, the sheets of Comparative Examples 1-3 have random droplet phase structures. Tables 1 and 2 at pages 56 and 63 of the specification show that Yamazaki and Nakao cannot realize a strong reflected light intensity at the specific light scattering angles, high directionalities and brightness of the display surface over the wide angle range.

Further, In Nakao and Yamazaki the liquid crystalline materials are aligned in a predetermined direction by applying a voltage. The process of orientation is therefore complicated and requires equipment for applying voltage.

On the other hand, the invention forms a sheet by spinodal decomposition from the liquid phase to form a phase structure having regularities in average distance between domains. The inventive sheet can exhibit both an isotropic incident light scattering characteristic and a high directionality or diffusibility to transmitted scattered light. This is discussed in the paragraph starting at page 29, line 20 of the specification.

Further, Tables 1 and 2 at pages 56 and 63 of the specification show a strong reflected light intensity at specific light scattering angles, high directionalities, and bright ness of the display surface over a wide angle range. Thus the advantages are clear.

As has been shown, Yamazaki and Nakao fail to render the present invention *prima facie* obvious. Further, unexpected results would fully rebut any obviousness that could be alleged. Accordingly, this rejection is overcome and withdrawal thereof is respectfully requested.

Information Disclosure Statements

Applicants thank the Examiner for considering the Information Disclosure Statement filed November 23, 2001 and for making the initialed PTO-1449 form of record in the application in the Office Action mailed may 8, 2003. The Examiner is respectfully requested to consider the Information Disclosure Statement filed August 19, 2002.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at

the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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